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INDIVIDUAL SPAWNING CONTROL IN DIFFERENT TURBOT (*Scophthalmus maximus* L.) BROODSTOCKS UNDER ARTIFICIAL AND NATURAL PHOTOPERIOD

by

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ABSTRACT

As fry output depends highly on management and control of the spawners, this paper examines the results with spawn obtained under a natural and artificial light cycle over a one-year period.

The broodstock consisted of 55 females and 69 males, distributed with the same age and sex ratio in 5 tanks. Two of tanks were subjected to controlled photoperiod (group A) and the other three to natural conditions (group B).

The spawning period of group A lasted from March until June, and that of group B from May to October. During this period, the spawning sequences of females were monitored individually.

The total production of larvae was 2,233,254 larvae, of which

71.72 % were from the tanks with controlled photoperiod.

In the fifth tank, females which had not spawned in the previous years were tested, and no larvae were produced. This confirmed that the criterion for selection was adequate.

A mean of 260,933 eggs per Kg of females were obtained, of which 45.56% were of good quality. The mean fertilization and hatching indices were 71.40% for group A and 21.99% for group B (not including tank T-5).

INTRODUCTION

Because of the great development of turbot rearing within aquaculture in recent years, a suitable methodology and a quality control of the broodstocks are getting more and more necessary for obtaining a better egg quality and larvae production (Omnes et al., 1991)

It seems to be clear that having a fry output depends on the broodstock they come from; if this broodstock consists on males and females well selected and fed, a good quality egg production will be obtained with an expected high viability.

The broodstock control by photoperiod and/or thermoperiod allows to manipulate the spawning period (Forés et al., 1990) with a 100% security, but we don't know if this affects the spawning quality.

The endogenous rythms of turbot ovulation and the difficulty of this species for spawning spontaneously in captivity makes us handle these fishes excessively. Nevertheless, higher efficiency has been obtained by daily stripping of broodstock females

(Fauvel et al., 1992) compared to twice-weekly stripping.

The aims of this work were to analyse the behaviour of the broodstock in a pilot scale hatchery during one year and to check if there were behavioural differences between a broodstock held under shifted pphotoperiod (group A) and another one under natural photoperiod (group B) Standarizing criteria for selection of non-spawning females was also attempted.

MATERIALS AND METHODS

In 1991, a turbot broodstock of 55 males and 69 males was kept at the facilities of the Spanish Oceanographic Institute in Vigo, divided in five similar groups and placed in five tanks, four of them with a 27 m^3 capacity and the last one (tank T-5) with 37 m^3.

Female/male ratio was 0.8 and the stocking density ranged between 2.79 and 3.97 Kg/m^3.

Group A, including tanks T-1 and T-2, was submitted to photoperiod and temperature control; temperature was 14±1 °C during the whole year, and the photoperiod consisted on 8 hours of light per day from June 1990 to January 1991, and 16 hours of light per day from January 1991 to June 1991 (end of the spawning period). This increase was made suddenly, and the first egg batches were obtained after about 60 days.

This group was fed "ad libitum" twice a week with semidry pellets made with a mixture of fish oil, fish meal, water and a supplement of vitamins A, C and E, giving a final composition of 29.40% protein, 10.20% lipid, 42.90% humidity and 6.90 % ash content.

Group B (tanks T-3, T-4 and T-5) was submitted to temperature control (the same as group A, that is 14±1 °C) but the photoperiod was natural. They were also fed twice a week but with fresh trash fish, with a basic composition of 25% blue fish and 75 % white fish.

Females were marked with liquid nitroge near the tail, and males near the head. The first ones were controlled individually by a systematic stripping trial. When ovulations occurred, each individual spawn was separately treated as follows:

Eggs were extrated by abdominal pressure (except an only spontaneous spawn of $221x10^3$ eggs in tank T-2). Only when the volume of eggs expelled was higher than 100 cc, they were artificially fertilized (dry method) by mixing them with the milt of two or three males. After 15 minutes, sea-water of the same temperature of the tank was poored on them. Three hours later, fertile percentage of buoyant eggs was calculated and they were transferred to an incubator with open water circulation (temperature 14 °C) and mild aeration. At the end of incubation (about 5 days later) the percentage hatch and number of larvae were calculated.

In addition to the four tanks in the photoperiod experiment, another tank (T-5) was used to check the efectiveness of the selection criteria for non-spawning females. This tank was similar to the first four in terms of female-male ratio and stocking density but the females had been selected because of:

1.- Not having been mature in previous years, or
2.- Not having spawned in previous years, or
3.- Having lost weight since the last spawning period.

RESULTS

The general characteristics of groups A and B can be seen in Table I. An ANOVA test was used to compare fertilization rate, hatching rate, number of larvae per tank and buoyant egg rate between groups A and B, not finding significant differences ($p<0.05$) in any case.

The 72.10% of females reached sexual maturity and were individually controlled, but only 24% of the 316 ovulations observed had more than 100 cc and were used for obtaining larvae.

There is a maximum in the egg production in April for the group under shifted photoperiod.

Eggs collected in September and October were not used because the spawns were always small (less than 100 cc) and of bad quality (Fig.2)

There was no mortality in the brodstock.

The 71.70% of the larval production belongs to the group submitted to shifted photoperiod and fed with a more complete semidry diet.

The mean fertilization rate for groups A and B is very similar (71.42 and 71.11% respectively), while hatching rate is different, with 24.40% for group A and 17.80% for group B.

No larvae were produced from the not-spawning females selected in tank T-5, in spite of the fact that some of them finished the maturation process, but none of the spawns were viable.

CONCLUSIONS

-Although no significant differences in terms of fertilization rate, hatching rate, Nº larvae/tank on fraction of buoyant eggs were found between the broodstocks held under shifted and natural photoperiod, 71.72% of the production came from the first one. This makes us think that this system povides higher operativeness and efficiency from the industrial point of view as the spawning periods can be manipulated with higher precision.

-We consider the selection criteria for not-spawning females to be valid as no larvae were produced in tank T-5.

-The massive production of eggs and larvae depends to a larger extent on a good broodstock selection than on the number of fish constituting this broodstock.

-Futher studies should be made on individualized spawning induction by hormonal stimulation as a complement to induction by photoperiod control, as we find in this work that 27,90% of the females did not mature.

BIBLIOGRAPHY

Devauchelle N., J.C. Alexandre, N. Le Corre and Y. Letty (1988). Spawning of turbot (Scophthalmus maximus L.) in captivity. Aquaculture, 69: 159-184.

Forés R., J. Iglesias, M. Olmedo, F.J. Sánchez and J.B. Peleteiro. (1990).Induction of spawning in turbot (Scophthalmus maximus L.) by a sudden change in the photoperiod. Aquacultural Engineering 9, 357-366.

Fauvel C., M.H. Omnes, M. Suquet and Y. Normant. 1992. Enhancement of the production of turbot (Scophthalmus maximus L.) larvae by controlling overriperring in mature females. Aquculture and Fisheries Management, 23, 209-216.

Omnes M.H., Y. Normant, M. Suquet and C. Fauvel. 1991. Analysis of turbot (Scophthalmus maximus) broodstock pilot scale production. European Aquaculture Society. Dublin.

	OVULATIONS														
	1st	2nd	3nd	4th	5th	6th	7th	8th	9th	10th	11th	12th			
FEMALE CODE	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	%FERT/ %HATCH	TOTAL SPAWNS/ GOOD SPAWNS	BOUYANT EGGS	LARVA PRODUCTION
39 (T-1)	60/8	65/29	90/69	87/0	67/39								14/5	1.359.000	231.700
67 (T-1)	60/12	97/44	62/5	69/17	53/0	74/24	68/26	60/0					15/8	2.564.000	360.150
10 (T-1)	55/0	78/63											9/2	667.000	112.500
17 (T-2)	92/52	36/0	35/13	58/59	62/4	80/15							20/6	3.456.000	251.100
55 (T-2)	97/66	55/7	76/20										7/3	1.233.000	197.000
99 (T-2)	97/29	40/22	89/0	91/67	97/67								12/5	1.143.000	151.500
108 (T-2)	55/2	89/38	93/94	50/0	81/18	81/30	40/0						16/7	1.900.000	178.450
2 (T-3)	58/0	30/0	87/16	85/45	65/36	61/30	89/82	93/26	79/13	67/3	95/6	71/33	14/4	4.972.000	369.700
54 (T-4)	70/33	94/25	75/15	98/24										1.334.000	182.05[illegible]

TABLA II: Ovulation characteristics of females from Groups A and B with a production of more than 100 000 larva per female

TABLA I: General characteristics of group A (shifted photoperiod) and B (natural photoperiod) along the spawning period [illegible]

GROUP	TANK	SPAWNERS NUMBER	FEMALE/MALE RATIO	MALES MEAN WEIGHT KG	FEMALES MEAN WEIGHT KG	SPAWNING FEMALES	EGG PRODUCTION %	BUOYANT EGGS %	MEAN EGGS PRODUCTION PER KG FEMALE	FERTILIZATION %	HATCHING %	MEAN LARVA PRODUCTION PER KG FEMALE	LARVA PRODUCTION
GROUP A	T-1	23	10/13	2,51	5,07	9/10	9.480	50,00	258.250	70,57	19,54	27.755	822.954
	T-2	24	11/13	2,83	4,23	4/11	7.732	49,80	419.950	72,30	29,24	42.729	778.7[illegible]
	Total values shifted photoperiod	47	21/26	2,67	4,65	13/21	17.212	49,90	339.100	71,42	24,39	35.242	1.601.[illegible]
GROUP B	T-3	26	11/14	3,67	4,79	10/11	5.410	42,00	317.800	64,59	14,23	14.056	426.4[illegible]
	T-4	25	11/14	3,71	5,02	6/11	6.017	42,00	172.486	77,63	21,29	17.739	205.1[illegible]
	Total values natural photoperiod	51	22/28	3,69	4,91	16/22	21.427	42,00	245.143	71,11	17,76	15.898	631.556
	T-5	26	11/15	3,69	5,24	5/11	3.010	44,00	136.180	55,00	0	0	0
TOTAL PRODUCTION GROUP A AND GROUP B (T-5 NOT NCLUDED)		98	43/54	3,18	4,79	29/43	38.639	45,95	292.122	71,27	21,08	25.570	2.233.754

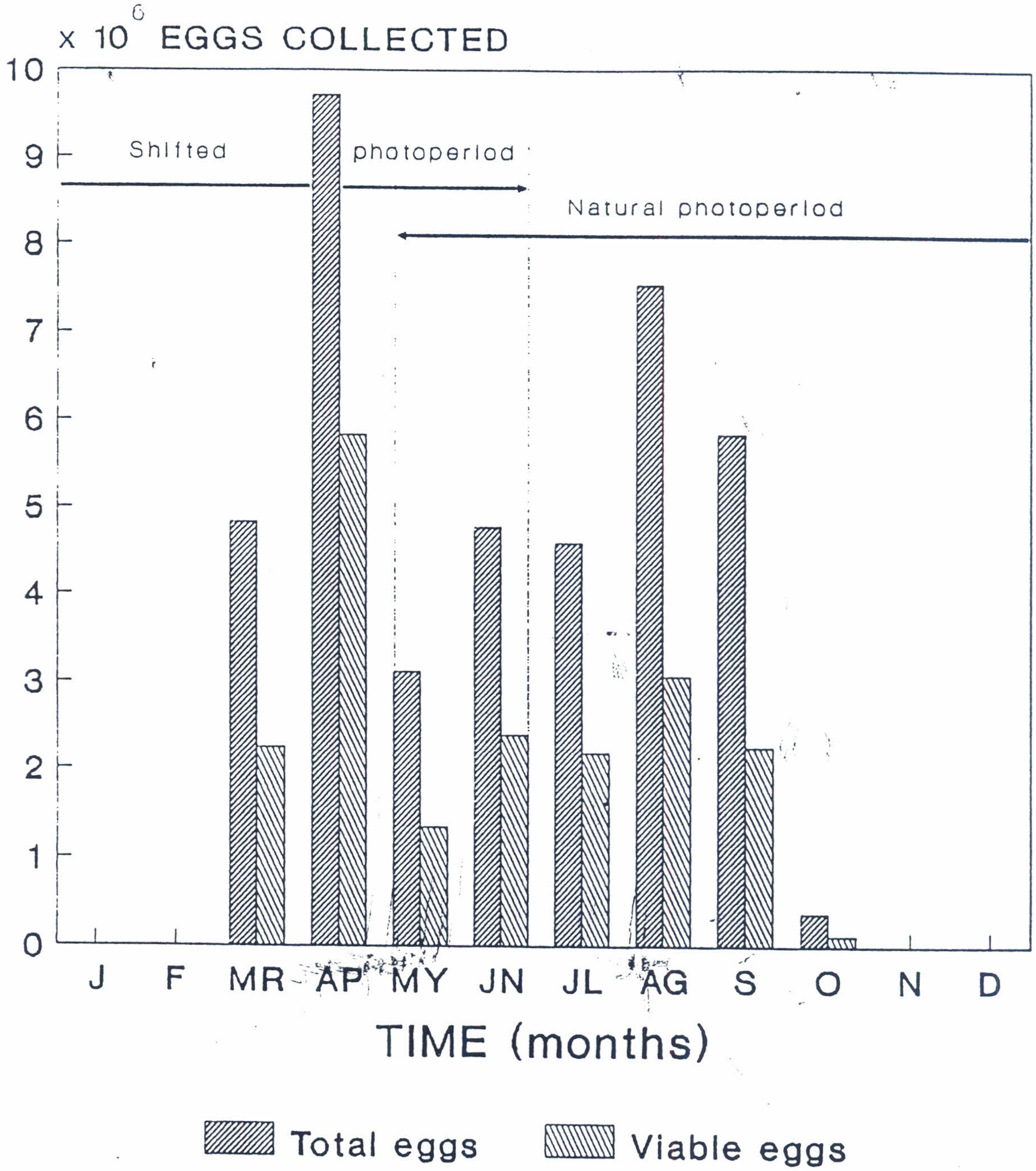

Fig.1.- TOTAL EGG PRODUCTION DURING 1991

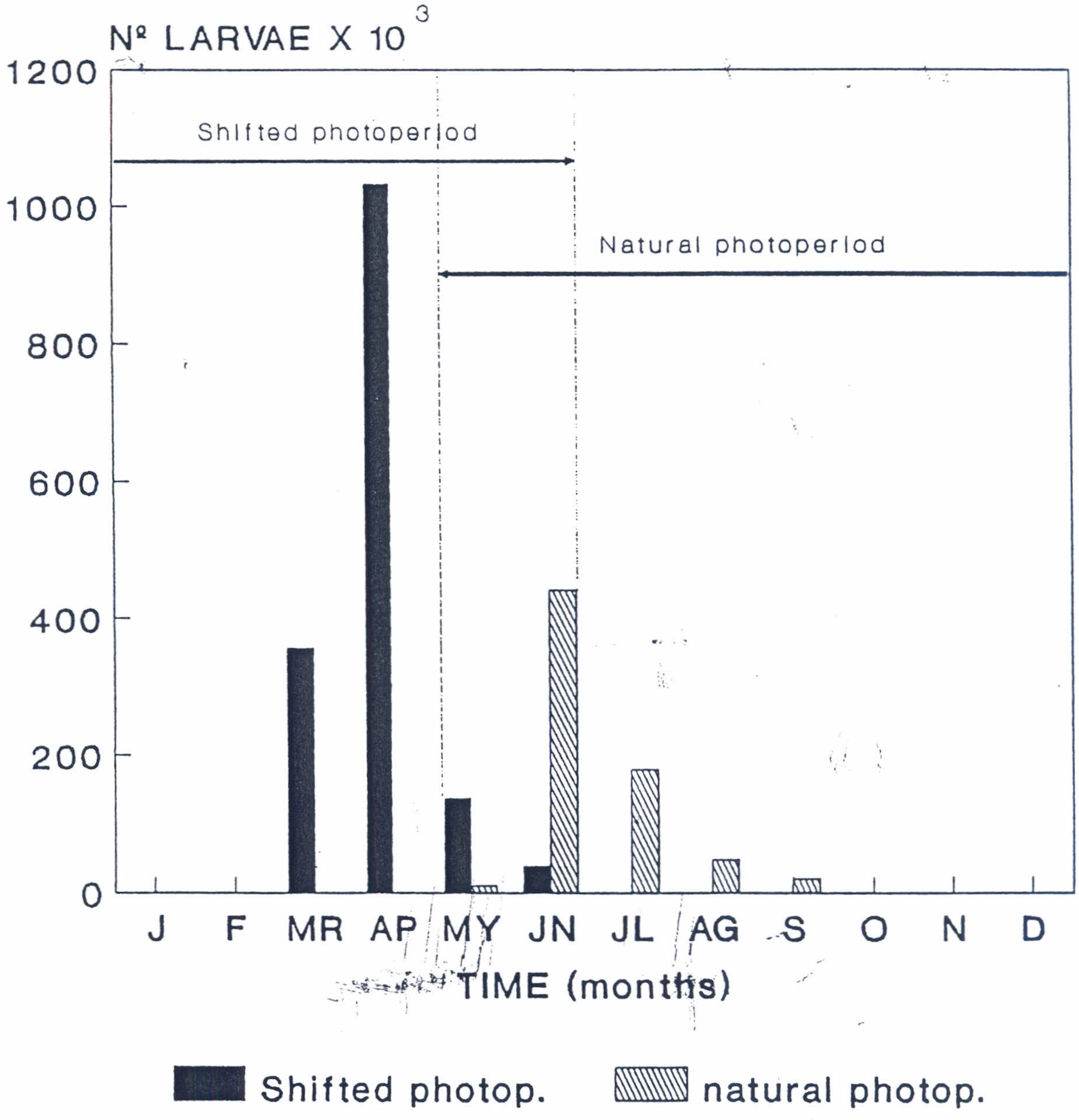

Fig.3.- Total larvae production from group A (shifted photoperiod) and group B (natural photoperiod) during 1991.